



VANDERBILT  School of Nursing

**Attention, Attention, We Need an Intervention -
Building Nursing Science to Integrate Genomics and
Impact Population and Global Health**




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Disclosures: None to report

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Learning Objectives

- ▶ Analyze genomic competency in graduate nursing programs.
- ▶ Evaluate educational genomic content in graduate nursing faculty and curriculum.
- ▶ Explore opportunities to engage in the translation of genomic science and build nursing's' capacity to integrate in academics, research and personalized health care.

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Background

- ▶ Research which measured actual, rather than perceived, genetic and genomic knowledge among **nursing faculty and students** has identified the **knowledge level to be consistently low.**

- De Sevo, M.R. (2015). Competency of **nurse educators** in genetics/genomics knowledge. *Journal of Nursing Education and Practice*, 3, 123-129. <https://doi.org/10.5430/jnep.v3n1p123>
- McCabe, M., Ward, L.D., & Ricciardi, C. (2016). Web-Based Assessment of Genomic Knowledge Among **Practicing Nurses**: A Validation Study. *Journal of Continuing Education in Nursing*, 47, 189-196. doi: 10.3928/00220124-20160322-09.PMID: 27031034
- Munroe, T. & Loerzel, V. (2016). Assessing **Nursing Students'** Knowledge of Genomic Concepts and Readiness for Use in Practice *Nurse Educator*, 41, 86-89. doi: 10.1097/NNE.0000000000000210
- Read, C.Y. & Ward, L.D. (2016). **Faculty Performance** on the Genomic Nursing Concept Inventory. *Journal of Nursing Scholarship*, 48, 5-13. <https://doi.org/10.1111/jnu.121755-13>



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Attempts by American Nursing Association (ANA)

- ▶ Essentials of Genetic and Genomic Nursing Competencies and Curricula Guidelines define essential genetic and genomic competencies for all nurses regardless of level of academic preparation, practice setting or specialty.

(<https://www.nursingworld.org/~4af0c1/globalassets/docs/ana/ethics/essentials-of-geneticgenomic-nursing-2009.pdf>)

- ▶ Essential Genetic and Genomic Competencies for Nurses with Graduate Degrees define essential genetic and genomic competencies for all graduate nurses.

(https://www.genome.gov/Pages/Health/HealthCareProvidersInfo/Grad_Gen_Comp.pdf)



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Essential Competencies in Genetics and Genomics for Nurses with Graduate Degrees

- ▶ Professional Practice
 - Genetic Risk Assessment and Interpretation
 - Genetic Education and Interpretation
 - Clinical Management
 - Ethical, Legal, and Social issues

- ▶ Professional Responsibilities
 - Professional Role
 - Leadership
 - Research



(https://www.genome.gov/Pages/Health/HealthCareProvidersInfo/Grad_Gen_Comp.pdf)

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Nursing Workforce

A national survey of the US nursing workforce reported **over half of nurses, 57%**, believed their genomic knowledge base was **fair or poor**.



Calzone, K.A., Jenkins, J., Culp, S., Bonham, V.L. Jr, & Badzek, L. (2013). National nursing workforce survey of nursing attitudes, knowledge and practice in genomics. *Personalized Medicine*.10 719-728. doi:10.2217/pme.13.64

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Methods

- ▶ Institutional Review Board approval (IRB# 190239) and permission for use of Genetic Nursing Concept Inventory (GNCI©)
- ▶ Email invitation and link to survey was sent to 236 faculty and 831 graduate nursing students via email distribution lists
- ▶ Online survey included:
 - Demographic Questionnaire
 - Nursing genomic education and training
 - Self-perceived level of genomic understanding
 - Genetic Nursing Concept Inventory (GNCI©)



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Topical Category (N=4)	Concept (N=18)	Inventory Item (N=31)
Human genome basics	Genome composition/organization	2,4,5,8
	Homozygosity and heterozygosity	13,29
	Gene function	1,6,9
	Gene expression	11
	Genotype-phenotype association	7
	Human genome variation	3
	Mutations	Mutations and disease
Germline and somatic mutations		18
Inheritance patterns	Dominance	10
	Autosomal inheritance	24
	Autosomal dominant	30, 31
	Autosomal recessive	15,16
	X-linked	17
Genomic health care applications	Multifactorial	25
	Family health history	23,26
	Pharmacogenomics	12,27,28
	Cancer genetics	20
	Genetic testing	14,22
Adapted with permission from Ward (2011)		



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Methods

- ▶ Electronic version of the GNCI[®] closely resembling the paper version was created in Research Electron Data Capture (REDCap[™]), a web-based platform to support data collection for research.
- ▶ Email contained a secure link to enable each participant access to the online survey in REDCap[™].
- ▶ Participants had to complete the entire survey in ≤ 30 minutes
- ▶ Data collected over 4-weeks.

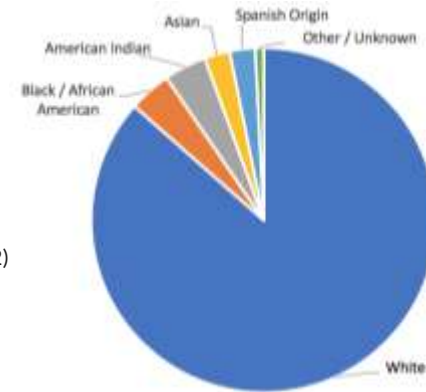
Harris, R., Taylor, R., Thielke, R., Payne, J., Gonzalez, N., & Conde, J. G. (2009). Research electronic data capture (REDCap): A metadata-driven methodology and workflow process for providing translational research informatics support. *Journal of Biomedical Informatics*, 42, 377-381.
<https://dx.doi.org/10.1016/j.jbi.2008.08.010>

Results

- ▶ 122 surveys completed
 - Response rate
 - Faculty 15.7% (n=37)
 - Students 10.2% (n=85)

Sample Characteristics

- ▶ Age
 - Mean 37.28 years (22-69, SD 11.36)
- ▶ Gender
 - Female 90.6% (106/117)
 - Male 9.4% (11/117)
 - Missing data on 5=4.1%
- ▶ Race
 - White 89.3% (109/122)
 - Black or African American 4.1% (5/122)
 - American Indian 4.1% (5/122)
 - Asian 2.5% (3/122)
 - Spanish origin 2.5% (3/122)
 - Other/Unknown 0.8% (1/122)



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Genomic Coursework

- ▶ Have taken/attended a Genetics/Genomics course for academic credit?

Yes 34.7% (42/121)

No 65.3% (79/121)

- Missing data on 1



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Genomic Continuing Education

- ▶ Have you completed continuing education programs on genetics and genomic topics?

Yes 6.6% (8/121)

No 93.4% (113/121)

- Missing data on 1



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Perceived level of proficiency with genetics and genomics content

Excellent 3.3% (4/122)

Very Good 12.3% (15/122)

Good 23.8% (29/122)

Fair 38.5% (47/122)

Poor 22.1% (27/122)

>50% of sample self-perception of proficiency rated as fair or poor

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GNCI® Results

- ▶ **Students'** mean score of **55.33** was higher than the **faculty's** mean score of **49.61**



GNCI® Results

- ▶ Nursing students scored higher than faculty on the GNCI in 3 of 4 categories:
 - genome basics
 - mutations
 - inheritance

but not genomic health care (67.95 vs 67.23)

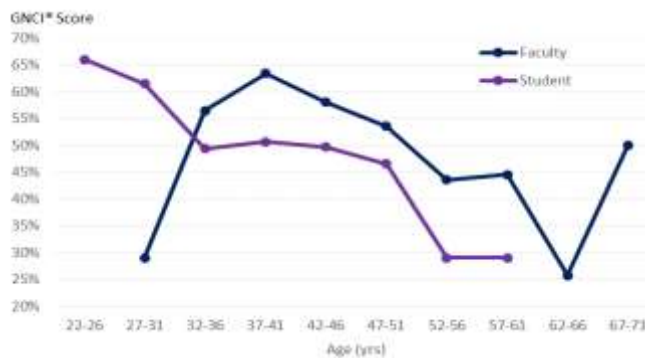
GNCI® Scores

Genetic Nursing Concept Inventory (GNCI®) scores for Nursing Faculty and Student Samples				
	Nursing Role	N	Mean Score	Std. Deviation
GNCI – Total score	Faculty	37	49.61	2.047
	Student	85	55.33	1.728
Genome Basics Subscale	Faculty	37	34.68	1.292
	Student	85	44.51	1.442
Mutations Subscale	Faculty	37	52.22	2.298
	Student	85	61.57	.647
Inheritance Subscale	Faculty	37	57.43	1.594
	Student	85	60.59	1.328
Genomic Healthcare Subscale	Faculty	37	67.95	1.809
	Student	85	67.23	2.008

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GNCI® Scores

- GNCI scores were inversely proportional to student age and lowest among faculty aged late 20s and mid 60s.



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Faculty (n=37)

Number of years as a faculty member teaching nursing students:

<1 year	5.4% (2/37)
1-3 years	16.2% (6/37)
3-5 years	8.1% (3/37)
5-8 years	16.2% (6/37)
8-10 years	5.4% (2/37)
10-15 years	18.9% (7/37)
15-20 years	18.9% (7/37)
20-25 years	5.4% (2/37)
> 25 years	5.4% (2/37)



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Genomics in Nursing Academics

► Estimate the total number of hours dedicated to genetic and genomic content in your personal nursing academic curriculum:

- 0 hours 16.4% (20/122)
- 1-2 hours 31.1% (38/122)
- 3-5 hours 23% (28/122)
- 6-10 hours 11.5% (14/122)
- 11-15 hours 4.1% (5/122)
- 16-20 hours 5.7% (7/122)
- 21-25 hours 0.8% (1/122)
- 26-30 hours 0 (0/122)
- > 31 hours 7.4% (9/122)

70% (86/122) of sample
had five or less hours

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Summary

- ▶ Results established baseline genomic knowledge of a sample of faculty and graduate nursing students.
- ▶ Faculty do not possess sufficient genomic competency to prepare students.
- ▶ Nurse leaders and educators need to recognize that the first step to the use of genomic data in health care starts with their knowledge and ability to influence nursing capacity to include genomics in scholarly and clinical practice.



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Implications for Nursing Education

- ▶ Educational efforts are needed to build nursing science capacity to translate and integrate genomics in clinical care, education, and research.
- ▶ Next steps include faculty development and curriculum planning to increase faculty and student competency in utilization of genomic concepts in practice.



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“Right now, genome sequencing is like the internet back in the late 1980s. It was there, but no one was using it. Then the first browser came and commerce started – it was the tipping point. The same thing could happen here.” George Church



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Thank You

Your time and interest are greatly appreciated!

A special thanks to-

- ▶ Dr. Deborah Trautman, President and Chief Executive Officer
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- ▶ Jennifer Doersam, MS, Program Manager Vanderbilt University School of Nursing

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